Vegetation Mapping

Introduction

A critical information need within many National Parks is accurate and up- to- date information on vegetation composition and distribution. Shenandoah National Park has pressing management issues that rely on an accurate vegetation map including visitor safety, fire management, forest insect pest management, and threatened and endangered species preservation.

The forests of Shenandoah have undergone dramatic changes in composition in the last decade as a result of an aggressive fire suppression program, gypsy moth defoliation, hemlock wooly adelgid infestation, southern pine beetle infestation, ice storms, large wildland fires, and floods. Discrepancies in the accuracy of current vegetation map data, in addition to the massive changes that have occurred in the forests, served as motivating factors to pursue creation of a new park- wide vegetation map. Work to construct the new vegetation map began in 2001 and will culminate with the delivery of the new map in March 2005.

Virginia Department of Conservation and Recreation (VA DCR) botanist collecting plot data for the new map in 2003.

Management Needs

Knowledge of vegetation composition and distribution is an integral part of many park activities including; planning, resource management and maintenance activities, natural and cultural resource inventory and monitoring, and coordination of scientific research projects. Interpretation of park vegetation, cultural landscapes and forest successional patterns is also based on accurate vegetation maps.

Existing errors in the 1987 forest cover type map, the lack of correlation between overstory composition and understory plant communities, and the number of large- scale changes in park vegetation have rendered it obsolete. Updated ecological association maps are critically needed

to provide information for resource management planning and decision making, as a foundation for interpreting park resources, and for planning and developing inventory and monitoring efforts and research.

Large flowered trillium (Trillium grandiflorum) in spring (Photo by R. Jung - USGS).

Current Procedures

The primary objectives of the 2005 vegetation map were to classify the vegetation communities of the Park according to the U.S. National Vegetation Classification scheme using field collected data about vegetation communities. The project began in 2001 with scientists from the U.S.Geological Survey −Biological Resources Division, Leetown Science Center (USGS) used terrain modeling techniques and existing information about environmental gradients to divide the park into ecological land units. Field sampling plot locations that represented all of the ecological land units were then generated for the entire park.

Field sample plots were visited by botanists from the Virginia Department of Conservation and Recreation (VA DCR) in 2002 and 2003 using their standard vegetation community assessment protocol (Virginia DCR, 2004). These methods typically utilize a 20 x 20 meter plot, in which all plants are identified, and a suite of variables is collected to describe vegetation and environmental characteristics. The VA DCR then used cluster analysis and ordination techniques on the data from 207 plots from this study combined with 103 plots previously completed, to determine natural community groupings.

These community groups and the associated Global Positioning System data were then transferred to scientists at the USGS who integrated the community information into their terrain- based ecological gradient models. The addition of the community data was used to train the

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model to predict the distribution of plant communities based on environmental gradients such as exposure, moisture, rock type, and the vegetation spectral responses mapped from aerial photos and satellite imagery.

While the map was being created at USGS, VA DCR botanists were working to create a link between the vegetation communities that they had identified throughout the park, and the previously described communities in the National Vegetation Classification System. This process, termed a "crosswalk" was completed in early 2004, and was followed by the creation of a key to the vegetation communities mapped within the park.

The newly completed community type key was then used in 2004 for accuracy assessment field sampling (Stadelmann et al., 1994) by a new team of botanists from the VA DCR. The accuracy assessment evaluated 224 points to determine how closely mapped units represented the actual vegetation on the ground. The results of the assessment will determine how much confidence can be assigned to the use of the map for planning, monitoring, or other purposes.

What We Have Learned

The vegetation mapping project successfully integrated the use of advanced gradient modeling techniques and multispectral and hyperspectral remote sensing imagery, with field vegetation sampling and community classification, to map the vegetation of Shenandoah National Park. The 2005 vegetation map divides the park into 34 vegetation community types compatible with the Association level of the National Vegetation Classification System. These communities represent 22 examples of upland forests and woodlands, one alluvial/riparian forest, six non- alluvial wetlands, and five outcrop communities. Three of the communities mapped for the park were new to the National Vegetation Classification and were described and ranked as part of the project. Eight of the communities are ranked as globally rare or uncommon, and two of the communities are endemic to Shenandoah National Park.

The final project report, digital map products, and imagery will be delivered to the park in March 2005. The new map is a noteworthy accomplishment and example of cooperation between agencies, that will benefit park staff, cooperators, and the public for many years.

References

Stadelmann, M., A. Curtis, R. Vaughn, M. Bailey, C. Convis, M. Goodchild, F. Davis, X. Li, K. Goodin, and D. Grossman. 1994. Accuracy Assessment Procedures: Final Draft. NBS/NPS Vegetation Mapping Program. U.S. Department of the Interior.

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Mapping crew making their way through a thick population of ferns in the park backcountry.